

Symposium: Adaptation for Landscaping Diversity in Farming and Habitat

Introduction of Topics by Overview of Current Agricultural Adaptation Needs

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Related materials: www.colorado.edu/ibs/eb/wiener/

Notes: (1) this presentation is the view of John Wiener and not necessarily that of the other speakers in the symposium; some revisions and additions after the meeting.

(2) References and some discussion are often in “speaker’s notes”

Symposium: Adaptation for Landscaping Diversity in Farming and Habitat

Introduction: John Wiener, then...

The Soil Conservation Connection... Dr. Richard Cruse,
Director Iowa Water Research Center, and Professor of
Agronomy

The Farm Scale... Dr. Reagan Waskom, Director Colorado
Water Institute, and Professor, Soil and Crop Sciences

The Ditch Scale... John McKenzie, J.D., Executive Director
of the Ditch and Reservoir Company Alliance

The Community Scale... William Burnidge, M.S., M.B.A.,
Director, Grasslands Program and Eastern CO Programs,
The Nature Conservancy

A fast tour of the bad news

- This presentation will be posted either separately or within a larger set of materials
- www.colorado.edu/ibs/eb/wiener/
- On many presentations posted, the citation is in “speakers’ notes” part of the slide.
- Materials can also be sent on request, though April – May 2013 are very busy.
- Wish this were better news!

Potential Water Supply Crises by 2025

(Areas where existing supplies are not adequate to meet water demands for people, for farms, and for the environment)

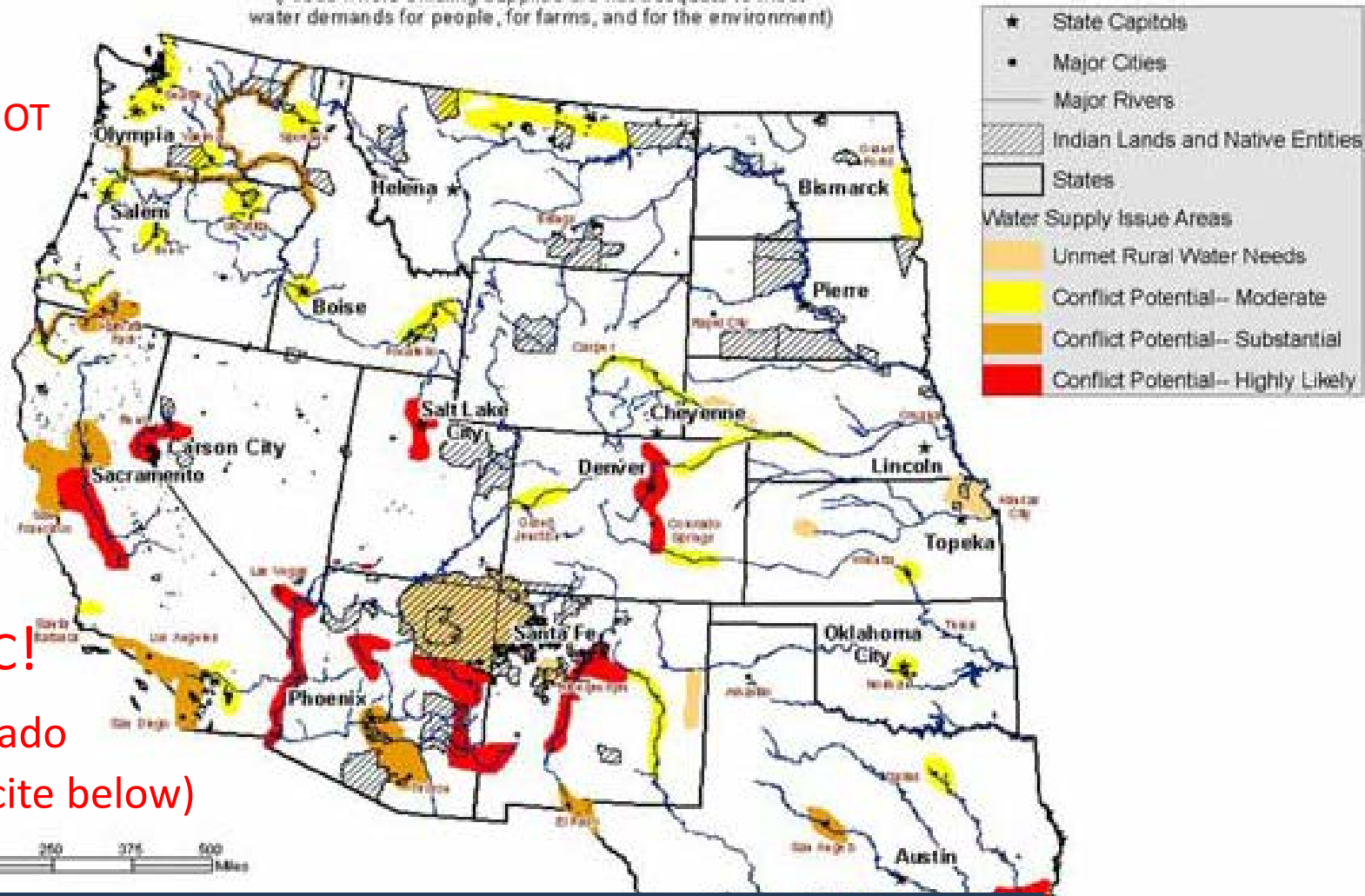
Drivers for SWSI

From 2003 – NOT
CONSIDERING
CLIMATE
DESTABILIZATION –

WHAT
GROWTH
WILL DO...
VERY

OPTIMISTIC!

2012- Colorado
River study (cite below)



“...water supplies are or will be inadequate to meet water demands, even under normal water supply conditions.” – U.S. Dept. of Interior
Water 2025

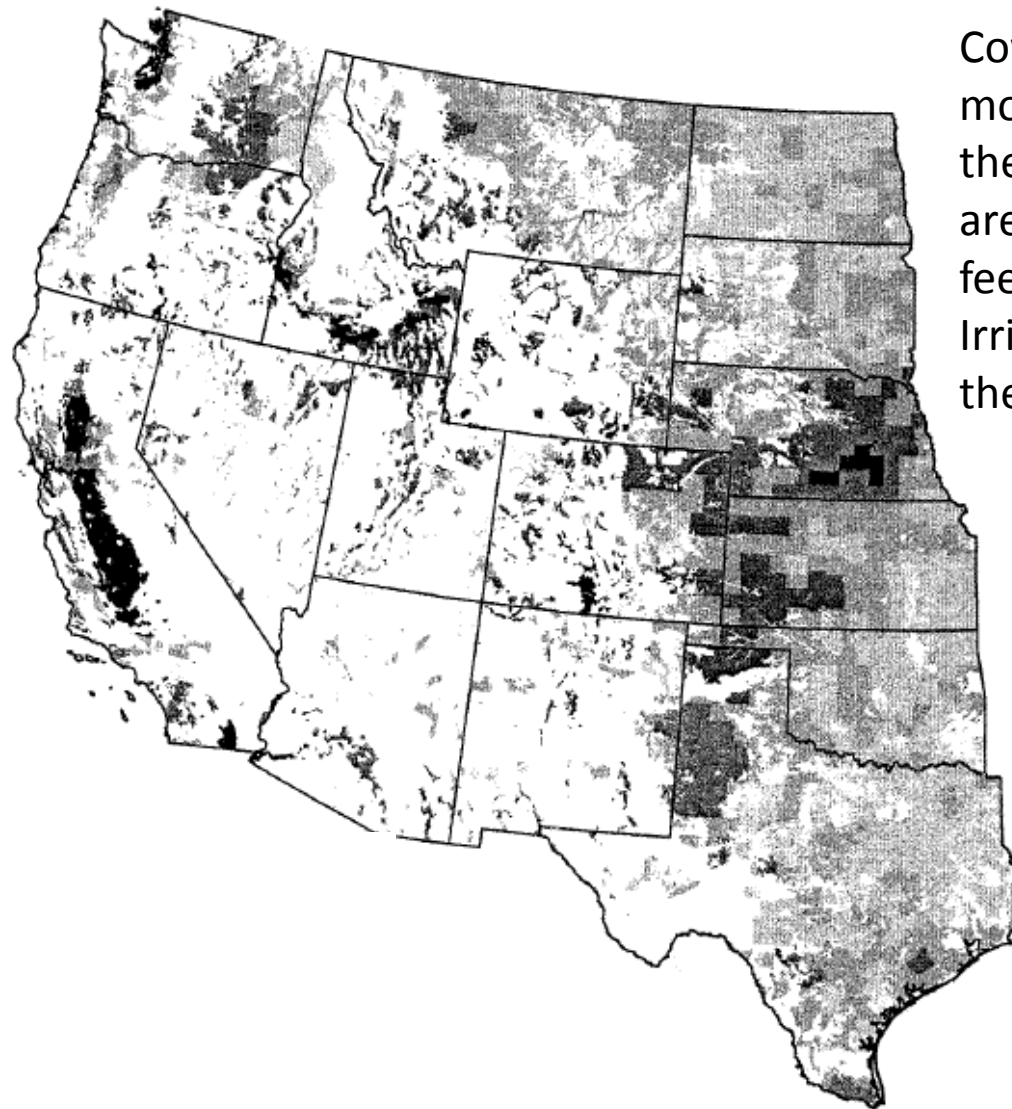


IRRIGATION
DENSITY –
THERE IS A
LOT OF IT!

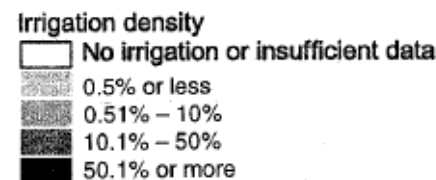
this is just to
show extent

STILL MORE
THAN 80%
OF THE
CONSUMPTIVE
USE OF WATER
IN THE WEST

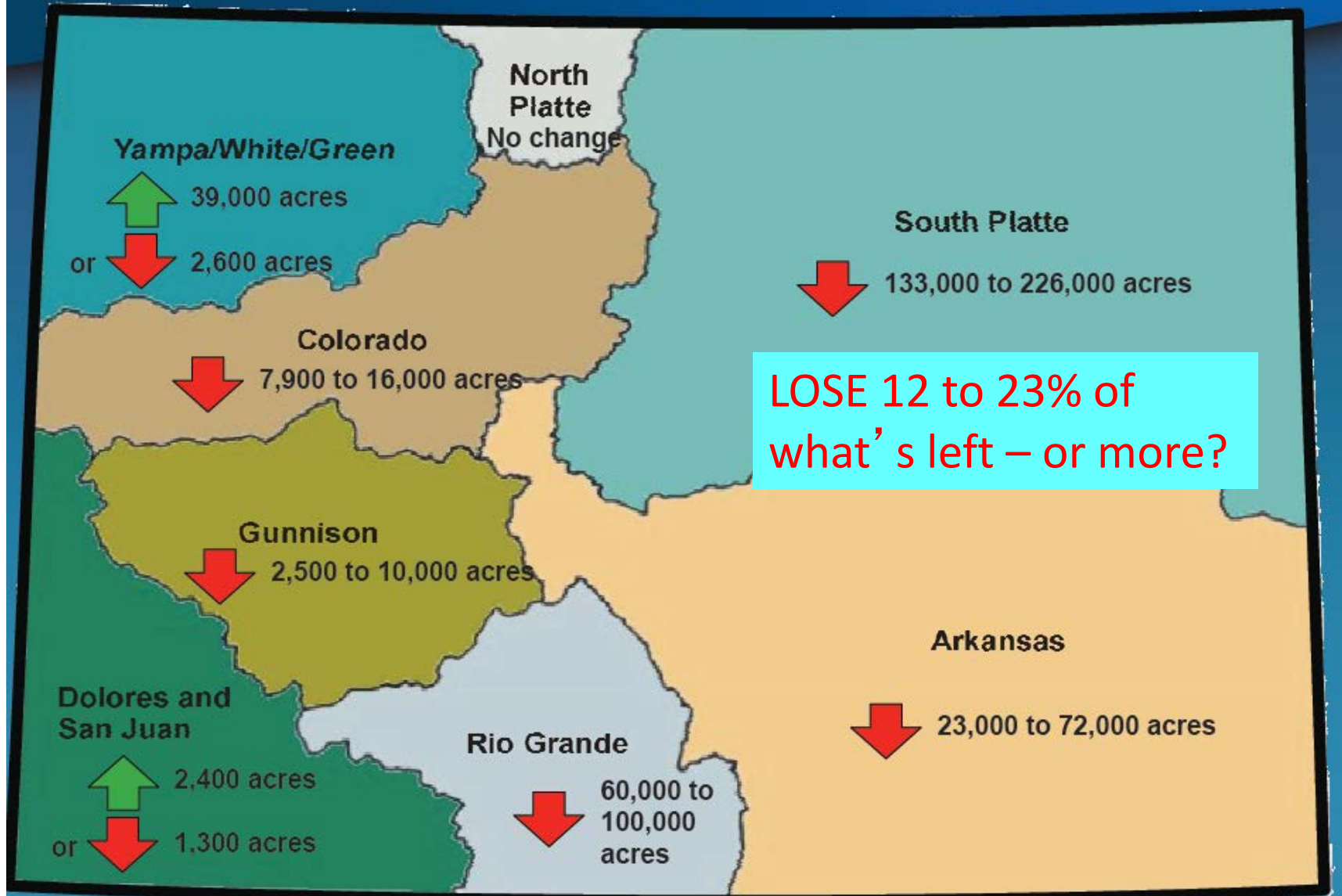
Cows are the big
money in most of
the West, but they
are raised on cheap
feed and hay –
Irrigation is basic to
the ag. economy



1997 Data –
Map from Gollehon
and Quinby, 2000
Water Resources
Development 16(2)



Potential Changes in Irrigated Acres (2000-2030)



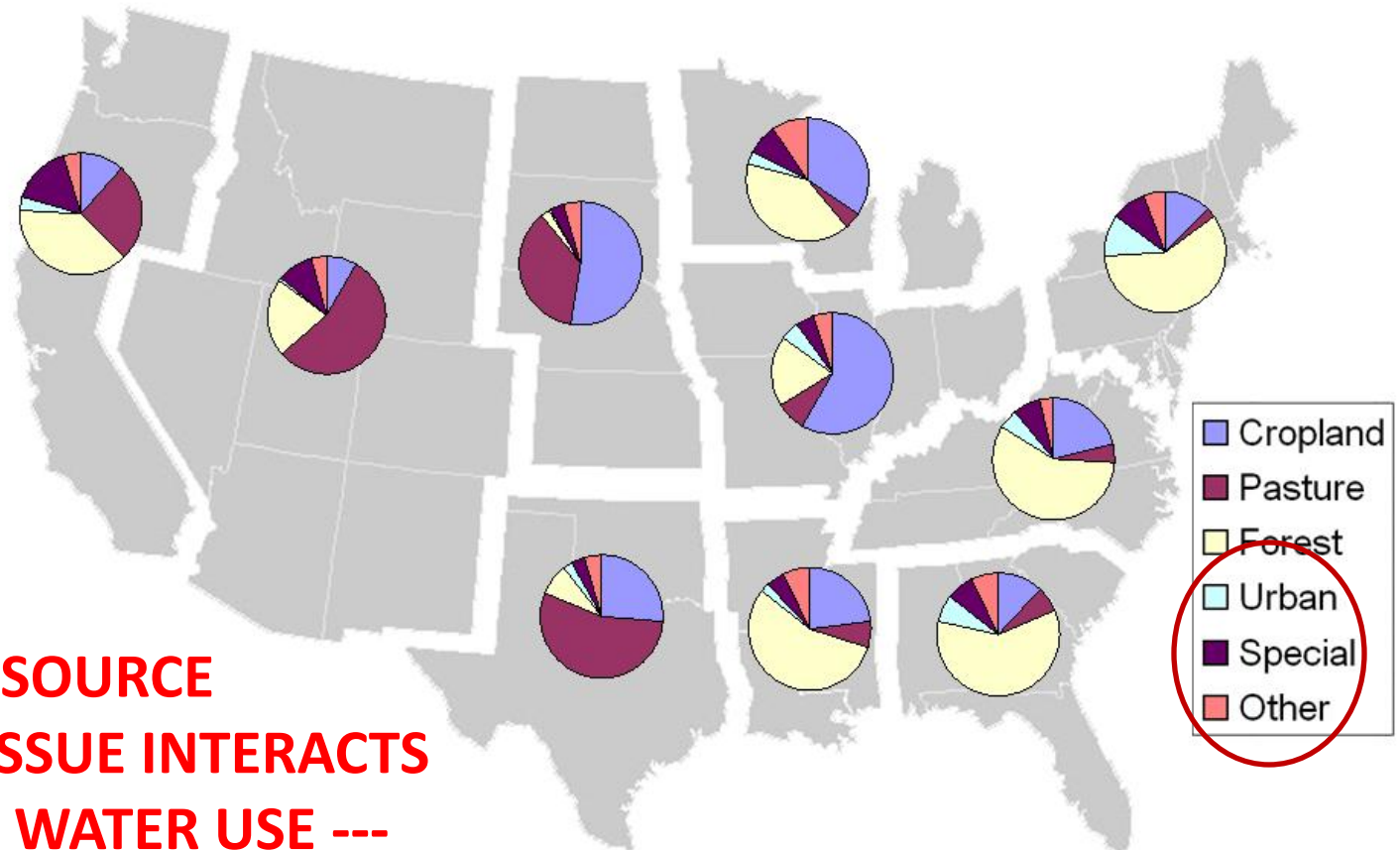
SWSI slide

BIG questions about this: **water to acres varies**, and the basis of the demand estimate is uncertain... And, **no climate effects!**



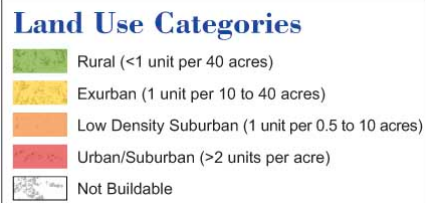
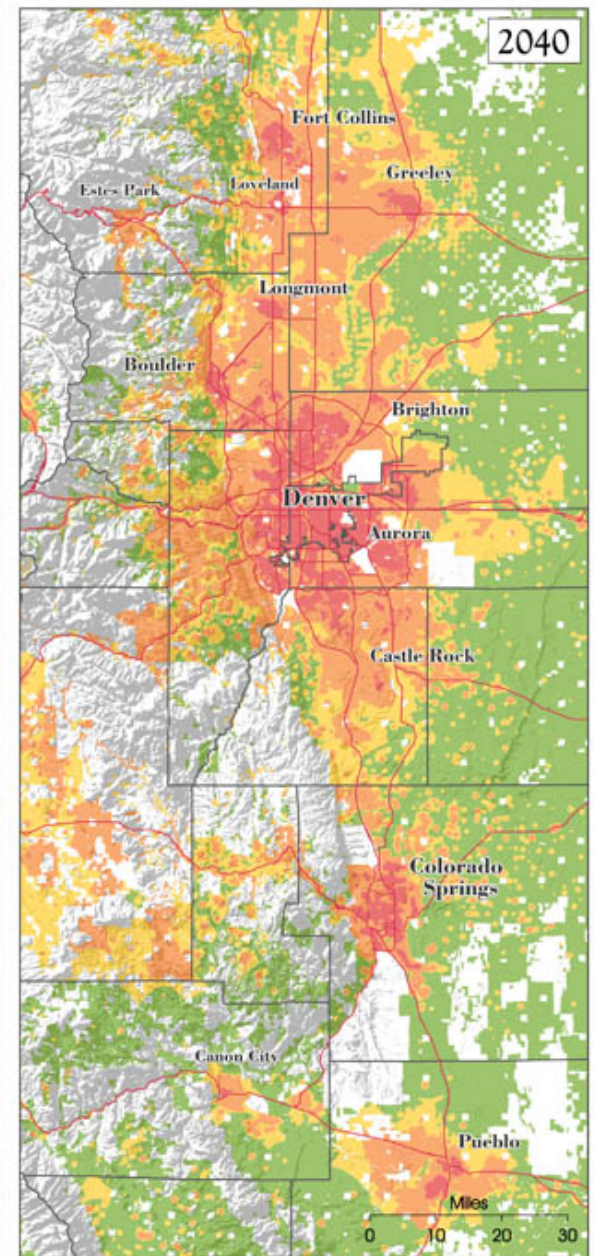
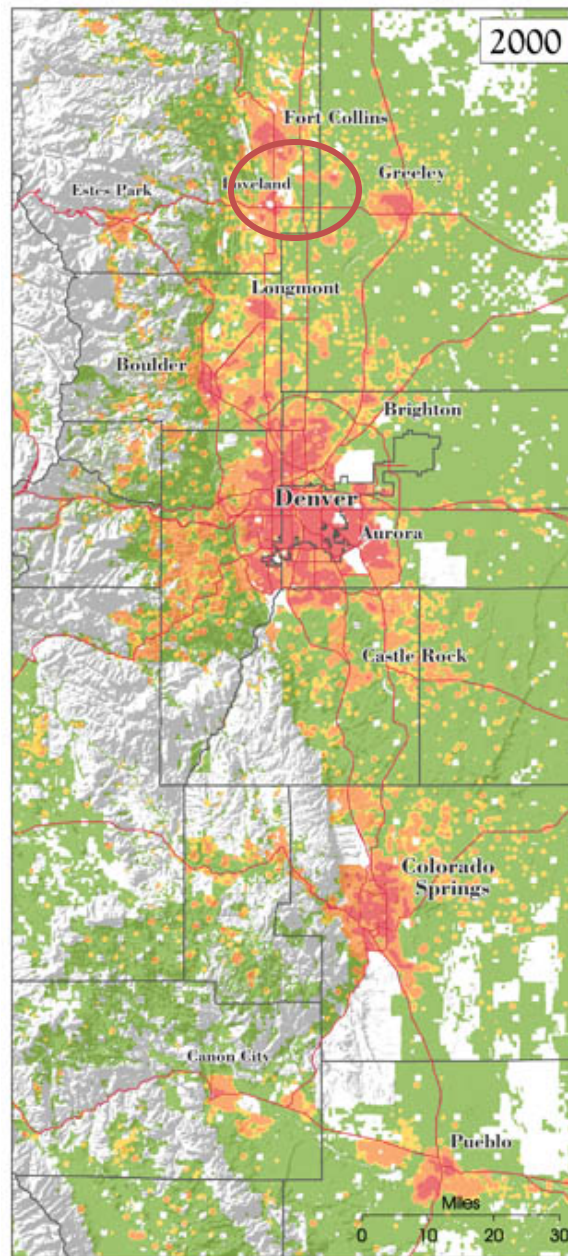
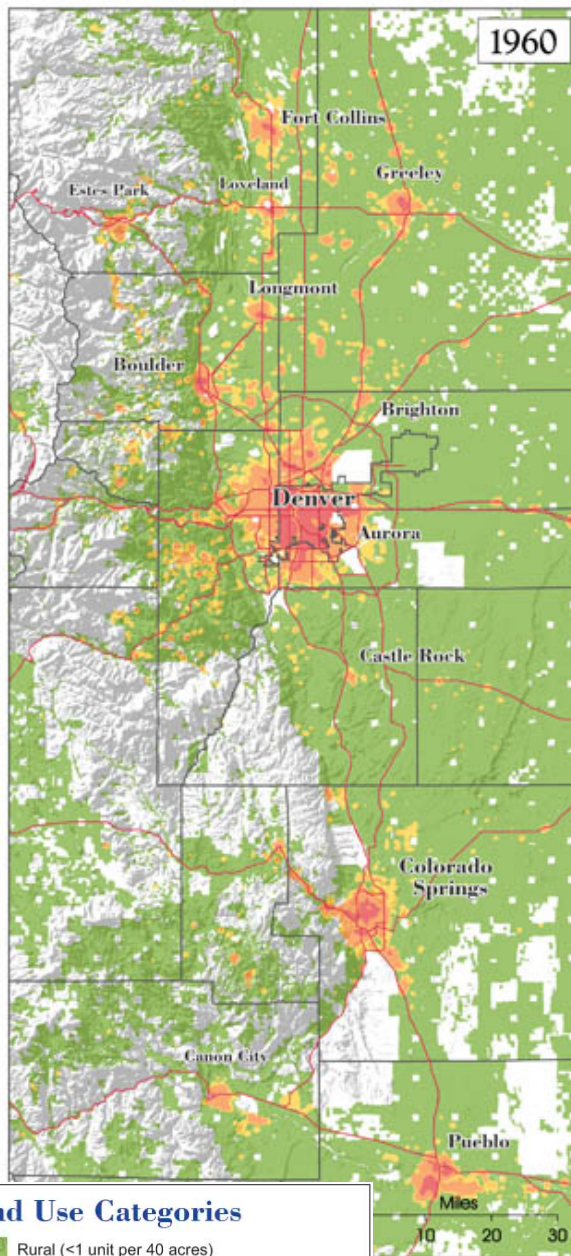
AGRICULTURE IS **THE BIG LAND AND WATER USE!!!** AND THE EXTENSIVE SOURCE OF EXTERNALITIES THOUGH NOT THE ONLY SOURCE

US Land Use by Regions, 2002



**EVERY OTHER RESOURCE
MANAGEMENT ISSUE INTERACTS
WITH LAND AND WATER USE ---**

Source: ERS-USDA Major Land Uses (<http://www.ers.usda.gov/Data/MajorLandUses/>).



Colorado Front Range

(Center of the American West, on the internet with two other cases)

Conversion of Best Farm land
North of Denver, CO

2005

Windsor

I-25

Boyd Lake

One square mile

Loveland

Conversion of Best Farm Land
North of Denver, CO

2011

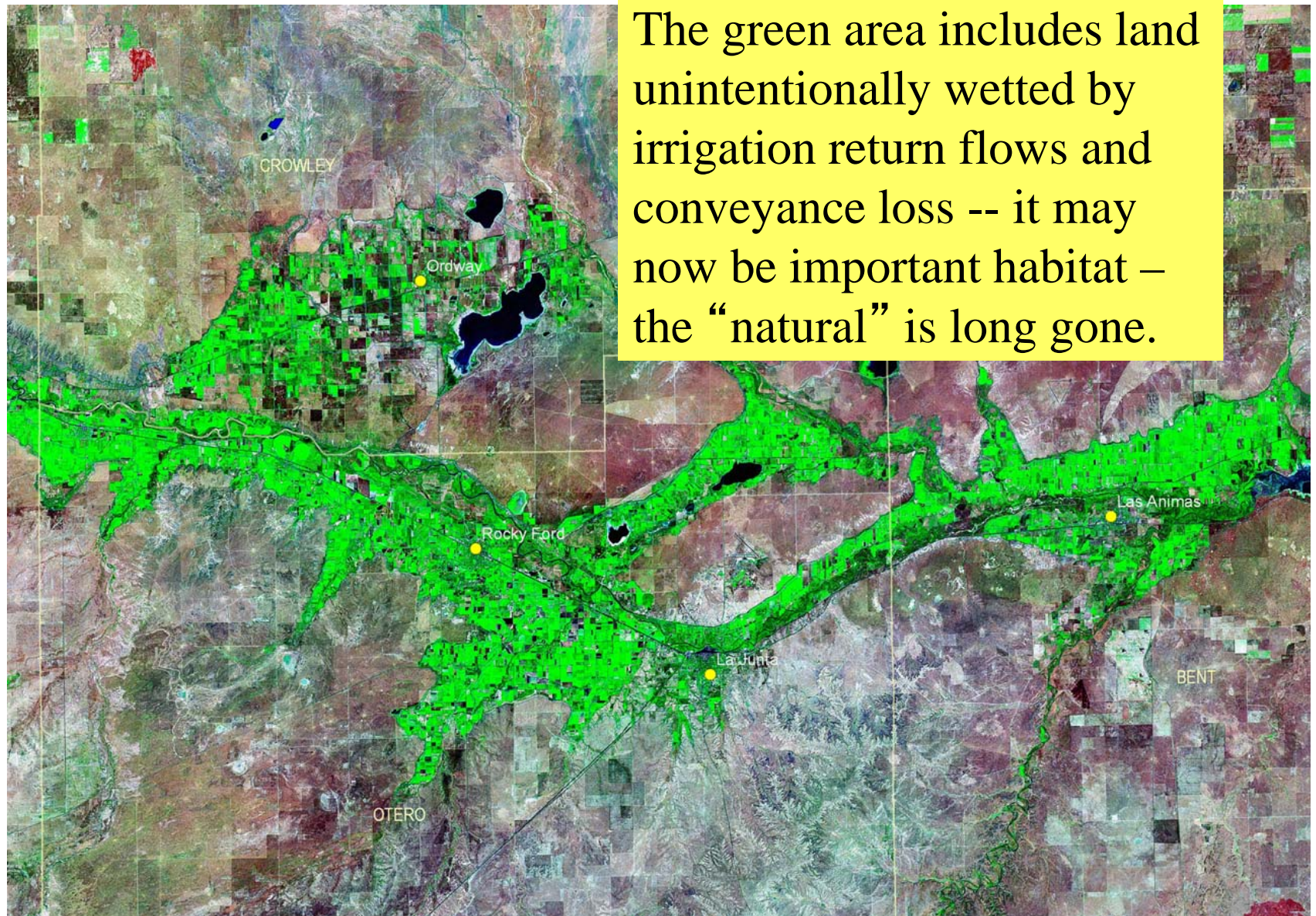
Windsor

Boyd Lake

I-25

Loveland

One square mile



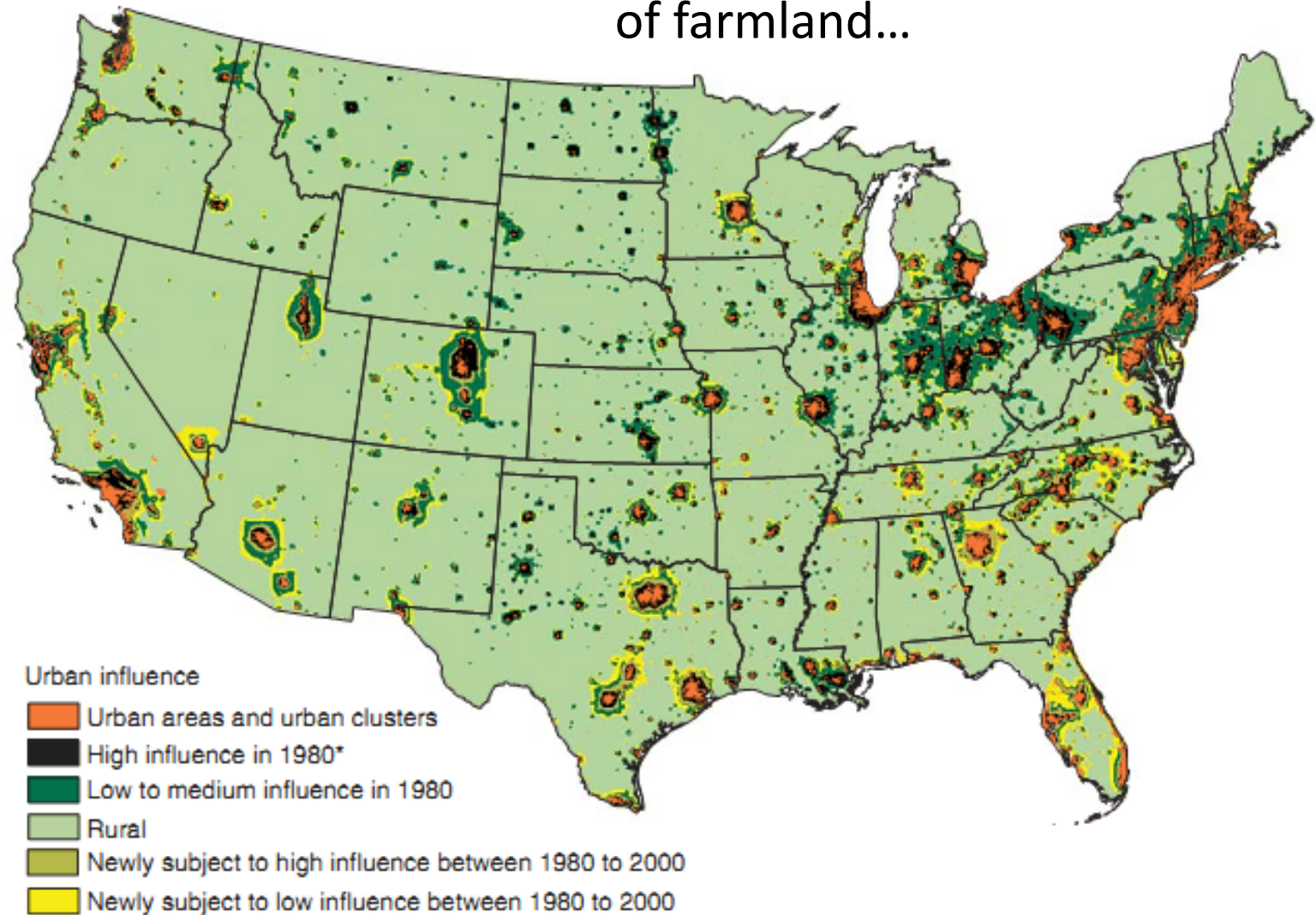
The green area includes land unintentionally wetted by irrigation return flows and conveyance loss -- it may now be important habitat – the “natural” is long gone.

Data source: Landsat Enhanced Thematic Mapper, 2005.

Map by Thomas W. Dickinson, Institute of Behavioral Science,
University of Colorado at Boulder

Figure 12
Degree of urban influence, 1980-2000

Affecting the “small ag” 60%
of farmland...



This is where the best land and water is or was, and the extreme rates of land conversion out of farming (see also Francis et al. 2012)



The “Hidden Half” of US Agricultural Potential: National Research Council 2010: Toward Sustainable Agricultural Systems for the 21st Century

“Small and mid-sized family farms together owned two-thirds of the total value of farmland, buildings, and equipment and managed roughly 60 percent of all U.S. farmland and cropland in 2007...” (p. 49)

For the 87% of farms with sales <\$250k/y, there was only 7% of the net farm income; about 80% of net income went to bigger sales farms... (p. 69)

See Family Farm Reports from USDA ERS...

There are important locational and size qualities of the small farms: critical in the peri-urban mosaic we want to preserve!

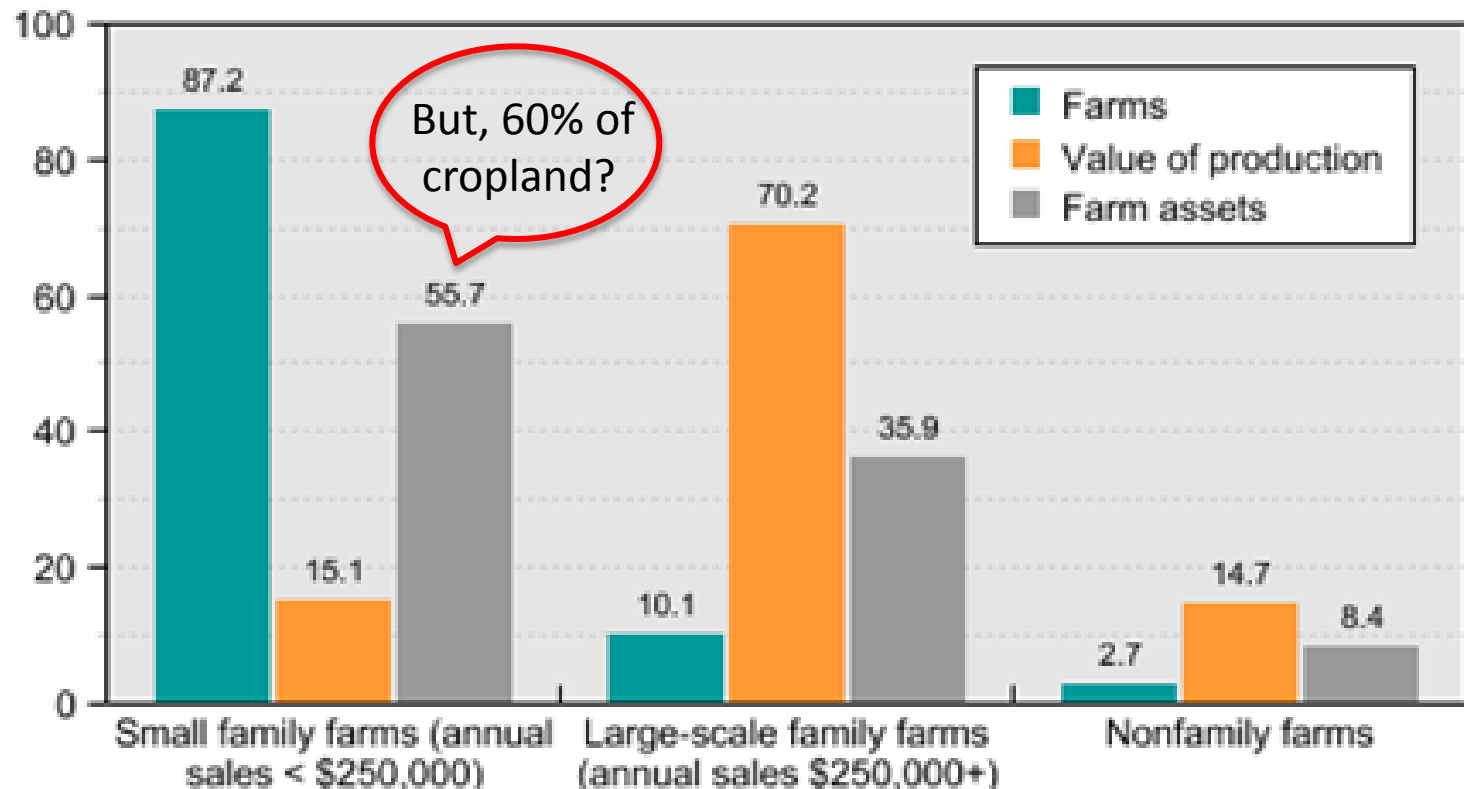
Amenity and recreational (and real estate) values, ecosystem services, habitat and Integrated Pest Management values... and the increasingly valued local and fresh food and associated values...

Meanwhile, “Small family farms account for most U.S. farms and a majority of farm assets”

(USDA Chart of Note, 06 Feb 2013; Hoppe and Banker 2010 Family Farm Report)

Share of total farms, value of production, and farm assets, 2011

Percent of U.S. farms, value of production, or farm assets



Source: USDA, Economic Research Service and National Agricultural Statistics Service, 2011 Agricultural Resource Management Survey, Phase III.



Bifurcation of US Farming: Two Sets of Problems

- For the **small** operations with 60% of US Farmland but only 16% of sales... and 7% of net farm income:
 - Urbanization, rural residential development
 - Inability to finance resilience to climate and “markets”!
- For the **Big CAFO and Monocultural conventional**
 - Erosion of soil, soil quality losses = Next talk!
 - Herbicide and other resistance evolving fast; no till at risk!
 - Input prices out of control, net being squeezed, treadmill
 - Water quality worsening with more corn, new land in crops?
- FOR EVERYONE: **CLIMATE VARIATION AND CHANGE** – higher intensity precip events, more frequent extremes with cumulative impacts...
- “THE SMOKING GUN”: 25 years, same # acres but 22% are not the same acres! **DISPLACEMENT FROM BEST LAND**

Big Equipment, Big Bucks...



A 60 Foot fertilizer applicator – to match most frequently bought corn planter

- **Drought drives uptick in fertilizer applicator sales**
- by [Jodie Wehrspann](#) Farm Industry News e-mail, 19 Mar 13
- Mar. 14, 2013
- Farm King, a division of Buhler Industries, showed a new 60-ft. liquid fertilizer applicator for the first time at the 2013 National Farm Machinery Show. Tony Fath, product specialist with Farm King, says the product has generated a lot of interest since then, as farmers question how much fertilizer remains in the soil after last year's drought.
- "Because of the drought, a lot of farmers are wondering whether there was enough moisture to get fertilizer down into the soil profile," Fath [of Farm King co.] says. "It's the perfect storm to create an uptick in sidedress applications."
- The new 60-ft. unit, the company's largest to date, is Farm King's first entry in the 60-ft. fertilizer-applicator market. **"The most popular size of corn planters sold today is 60 ft., so the applicator needs to follow that [width],"** Fath says.
- Suggested list price: **\$96,100** for the 2,400-gal. model 2460 with 60-ft. toolbar, 25 coulter/30-in. spacing as seen at the show.
- Contact Farm King, 2500 Airport Dr. S.W., Willmar, MN 56201, 320/235-1496, email info@buhler.com, or visit www.farm-king.com

Herbicide-resistant Weeds Threaten Soil Conservation Gains: Finding a Balance for Soil and Farm Sustainability



Back to pre-emergent see, post-emergents.... Tillage... Stay with the package
But make the package more complicated... And, see National Research Council 2012 Summit
On managing resistant weeds...



The response to herbicide-resistant weeds?

- Return to tillage, stay on the treadmill of high inputs!
- “Stack” herbicide resistance traits into the crops: back to 2, 4-D and “dicamba” – on with the show!
- New packages: the seed, and the glyphosate and the additional second herbicides and additional treatments pre-emergent, post-emergent? “Burn-off” between crops with additional herbicides?
- “evolution will win” – but what damage will we do?
- Is this just the **wrong thing to do** with climate change increasing the intensity of precipitation?
 - IPCC – Special Report on Extremes of Weather and Climate
 - USDA Tech. Info. Bull. 1935: Climate Change and U.S. Ag...



Climate Effects on Soils

- Higher soil temperatures alter nutrient and carbon cycling by modifying the habitat of soil biota, which in turn affects the diversity and structure of species and their abundance.
- Heavier downpours in some regions will lead to increased soil erosion. In addition increased precipitation will result in water-logging of soils, thereby limiting oxygen supply to crop roots and increasing emissions of nitrous oxide and methane. Altered rainfall, whether through increased or decreased precipitation, will affect soil chemistry and biology.
- Soil water retention capacity will be affected by rising temperatures and by a decline in soil organic matter due to both climate change and land-management changes. Maintaining water retention capacity is important to reducing the impacts of intense rainfall and droughts, which are projected to become more frequent and severe.
- Prolonged spells of heat and drought between rainy periods may cause wilting, desiccation, and soil salinization, which may in combination reduce crop yields.
- Increased temperature and decreased moisture tend to accelerate the decomposition of organic material in soils, leading to a decline in soil organic carbon stocks and an increase in CO₂ emissions to the atmosphere.

From the joint statement of ASA, CSSA, SSA...
habitat of soil biota... diversity ... abundance

downpours... increased soil erosion...

affect soil chemistry and biology...

water retention capacity... soil organic matter...

impacts of intense rainfall and drought...

See also Crop Science Society of America,
2011, Position Statement on Crop Adaptation
To Climate Change.

**NEW: USDA Technical Information
Bulletin No. 1935: Climate Change and
U.S. Agriculture... Walthall et al. , 2012
and National Climate
Assessment, Draft January 2013.**

The Real Goal: Conserve **inherent** agricultural capacity

A working definition:

Capacity of agricultural resources, including soils, techniques, crafts, and skills, live true-breeding seeds and livestock, to produce food, feed and fiber with inputs only from local and regional agricultural and related activity.

Right now, the only piece of the puzzle were burning faster than good soil is farmers!



So... Keeping Water in Ag is NBNS!

(Necessary But Not Sufficient)

- Better water management possible
 - PARTICIPATION, PARTNERSHIPS...
 - COST COMPARISONS needed, short-term
 - GOALS and VALUES needed, long-term
 - PARTNERSHIPS and MONEY– not just talk...
 - Integrated Water Resource Management IF YOU CAN... take the time and have the money
- Better water transfers ARE NOT ENOUGH
 - Threats to conventional agriculture
 - Water too valuable for some farming (under current market conditions) – How to get out of market? (see notes)



Thinking out of the farm-scale box

- “If it was just losing the water, why did we lose so many farms in the wet years?”
 - Often asked; not answered often
- My argument: farmers and ranchers need to use all their assets, with water as key, AND...
- Cities and water managers are critical partners
 - Where states don't act or are self-crippled
 - Citizen have far wider interests than water rates
 - Water suppliers have foresight!
 - And cities have cheap long-term capital



Soil and Water Conservation
Society

Ankeny, Iowa

2010

THIS IS THE SOURCE on
**disproportionality (see
notes) of impacts on water
from some operations.** But,
now, add disproportionality
in glyphosate
resistance management.

LANDSCAPE scale allows FAR
BETTER TARGETING –

New placement strategy for
filters and buffer strips...

Compatible with Integrated
Pest Management, and with
nutrient capture and use ---

WHAT WOULD YOU DO IF YOU
OWNED ALL THE PIECES?

Managing Agricultural Landscapes for Environmental Quality II

Achieving More Effective Conservation



Pete Nowak and Max Schnepf, Editors



Voluntary Adaptation (see notes)

- Can't force conservation on private land/water
- Can't buy them into social optimum
- Can't buy them into very long-term...
- BUT – Can we help them organize on “right-size” scales, help with tools like municipal finance capacity (long-term cheap capital!)
- Help with support for ecosystem services, amenities, recreational values....
- WAYS TO TRANSITION TO SUSTAINABLE FOR “THEIR” REASONS... **WHAT WOULD YOU DO IF YOU OWNED ALL THE PIECES? THINK BIG!**



Beginning Points

- An emerging challenge: to take the idea of **maximum economic yield** (not the same as maximum yield of an output, but best return on investment of inputs)... and apply that to the long planning horizon!
- **RIGHT-SIZING** – best scale for a given combination of operations... (e.g. best scale for an on-farm energy need not same as for export) – **economies of scale**.
- **AND INTEGRATED MULTIFUNCTIONAL AGROECOLOGY** – combine sets of right-sized operations, resources, and projects to achieve higher levels of resilience... (e.g., sets of renewable energy sources and scales of farms and cooperating groups of farms and ranches). (long note!)

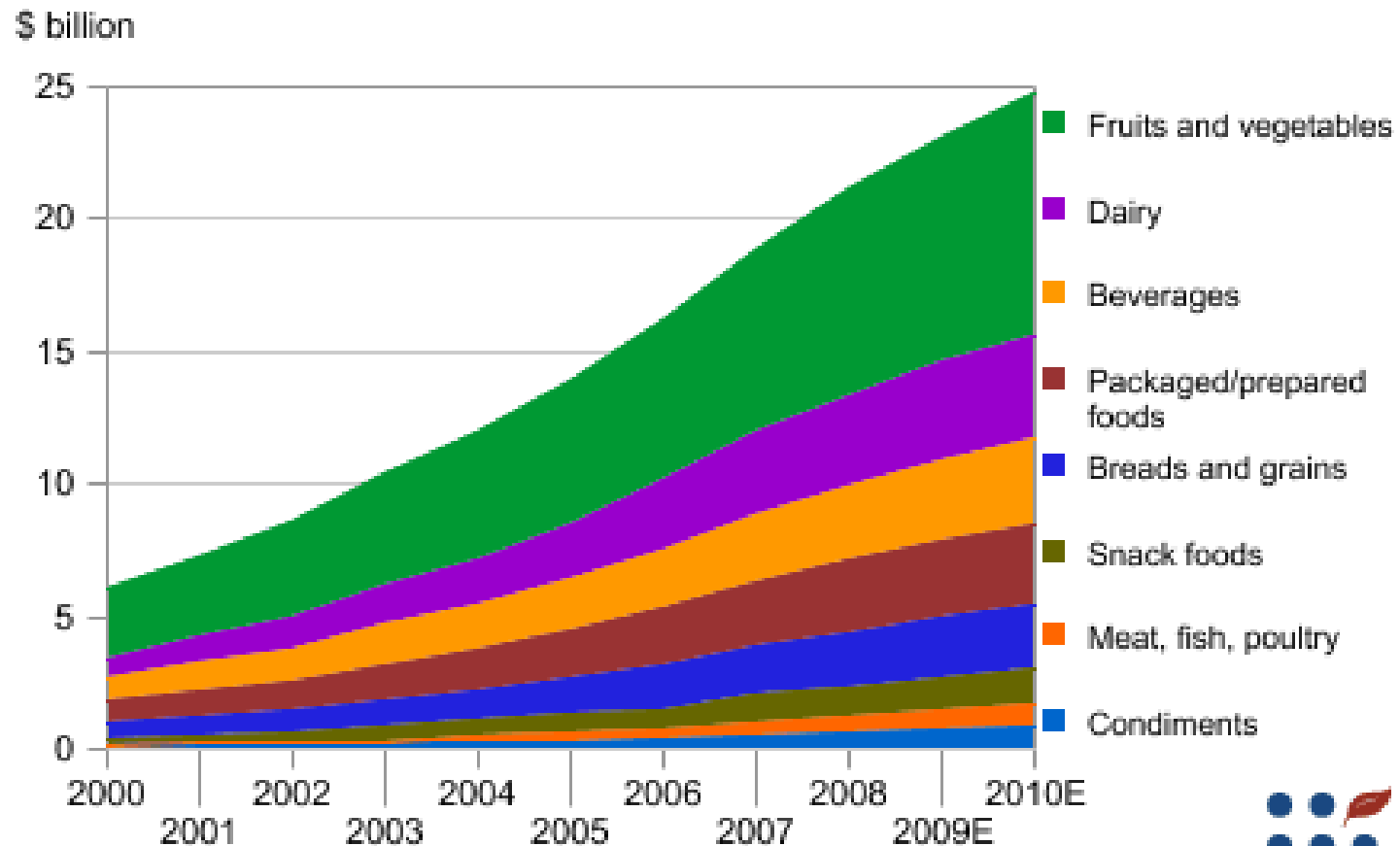


Local Preference – transition hope?

- Sharp change in consumer preference since USDA “organic lite” standards
- Big Willingness To Pay – US wide, rural as well as urban – for Local
- Enormous increases in Community-Supported Agriculture, direct sales and Farmers’ Markets, as well as “local” with premium prices in big retail chains...
- And, big electoral support for local land preservation and open space (Trust for Public Land “conservation vote website)

<http://www.ers.usda.gov/Briefing/Organic/Demand.htm>

Fruits and vegetables accounted for 37 percent of U.S. organic food sales in 2008



E = Estimate.

Source: Nutrition Business Journal.



And this has gone too long! But in the hope of providing some sense of urgency for changes!



Nobody in the driver's seat... this is "development" of some of the best farm land in the US